UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

BEFORE THE ATOMIC SAFETY AND LICENSING BOARD

In the Matter of	)	Docket Nos. 50-247-LR
	)	and
	)	50-286-LR
ENTERGY NUCLEAR OPERATIONS, INC.	)	
	)	
(Indian Point Nuclear Generating Units 2 and 3)	)	
	)	March 19, 2009

HUDSON RIVER SLOOP CLEARWATER, INC.'S PETITION TO FILE A NEW CONTENTION BASED UPON NEW INFORMATION

Hudson River Sloop Clearwater, Inc. ("Clearwater") submits this contention because it has discovered that the New York State Department of Conservation ("DEC") has received, and has issued a letter that it will take lead agency status on, an application of United Water of New York ("UWNY") to build a desalination plant to extract water from the Hudson River for use as municipal drinking water for Rockland County. As a result of the application and this letter, Entergy Nuclear Operations, Inc. ("Entergy") and the Nuclear Regulatory Commission Staff ("NRC Staff") must assess the environmental impacts of the license renewal application ("LRA") on drinking water and water quality. This contention is timely filed as set forth in the Board's Order dated February 4, 2009.

As discussed below, Clearwater's proposed new contention meets the standard for admissibility because Entergy's environmental report ("ER") submitted with the LRA and the Supplement 38 to Generic Environmental Impact Statement for License Renewal for Nuclear Plants, Regarding Indian Point Generating Units 2 and 3 (hereinafter referred to as "DSEIS") fail to make a complete and thorough analysis of the impacts of license renewal upon the Hudson River as a source of drinking water and the potential for future

degradation of the Hudson River as a drinking water source. Clearwater demonstrates below that the "proposed new contention meets the standard admissibility requirements of 10 C.F.R. § 2.309(f) (1) (i) – (vi)." Entergy Nuclear Vermont Yankee L.L.C. (Vermont Yankee Nuclear Station), 62 N.R.C. 813, 819. As a result, the Board must admit the proposed contention for adjudication.

NEW INFORMATION

UWNY filed an application with the DEC to build a desalination plant to extract potable water from the Hudson River to meet a portion of municipal water demand for Rockland County. UWNY proposes a Long-Term Water Supply Project ("LTWSP") to include a desalination facility in the Town of Haverstraw, Rockland County. See DEC letter dated January 26, 2009 annexed hereto as Exhibit 1. The desalination plant will produce potable water from the Hudson River. Id. The LTWSP proposal includes a raw water intake unit that would be located along the Hudson River, near the former US Gypsum dock, in Haverstraw Bay. Id. The water intake for the plant would be situated 3.5 miles southwest of Indian Point and slightly downstream (see Map of Westchester County showing proximity of Indian Point to United Water of NY's proposed desalination plant in Rockland County, annexed hereto as Exhibit 2). From its location the desalination plant will extract contaminated water on a continuing and regular basis According to the DEC, the plan

> for the proposed pilot desalination plant intake would withdraw water at a rate between 170 and 300 gallons per minute. The intake would extend into the Hudson River adjacent to an existing pier and would be anchored to the river bottom.

Id. Significantly, at the completion of the pilot program, UWNY will build a full sized desalination plant to extract 10 million gallons per day from the Hudson River and provide 7.5 million gallons per day of useable water to Rockland County. The plant will use reverse osmosis ("RO") to filter the water extracted from the Hudson River. See Declaration of Manna Jo Greene dated March 19, 2009 ("Greene Dec.") at ¶ 6. RO is not an effective process for removing tritium, cesium-137 and strontium-90 Id. at ¶¶ 6 and 11-13. In addition, several water authorities along the lower Hudson already extract water from the Hudson River to meet daily municipal demand, including the Poughkeepsie Water Treatment Facility that provides drinking water to 75,000 individuals within the City and Town of Poughkeepsie, the Dutchess County Water Authority, and the Village of Wappingers Falls; the Highland Water District in the Town of Lloyd; the Port Ewen Water District in the Town of Esopus; and the Rhinebeck Water Treatment Facility that provides water to the Town and Village of Rhinebeck. In addition, the Chelsea Pump Station at New Hamburg provides an emergency water supply station for New York City. The impacts of license renewal on the water quality of these water supplies are not assessed or even mentioned in the ER or the DSEIS.

The Hudson River is a tidal estuary, which coupled with diffusion effects, is capable of transporting potentially harmful substances upriver, as well as downriver and cross-river. The distances that radioactive isotopes or other toxic substances released from Indian Point may travel must be evaluated.

Additionally, the impacts of the hazardous waste products created by the desalination process must be assessed. The extracted radiation will be treated at a

wastewater treatment plant resulting in a more concentrated hazardous material that must be disposed.

It is clear that the Hudson River is currently, and during the period of the renewed license will be, used as a source of drinking water. As such, Entergy and the NRC Staff must assess the impacts upon the Hudson River as a source of drinking water in making their environmental assessments.

The need for this assessment is further mandated by the fact that strontium-90 and cesium-137 have been detected in the groundwater at Indian Point at concentrations many times the Maximum Contaminant Level ("MCL") allowed by the Environmental Protection Agency ("EPA") in drinking water.[1] Entergy's own internal status reports indicate the presence of at least two groundwater plumes containing highly contaminated water underlying the site, one of tritium and the other of strontium-90 and cesium-137. This contamination has also been confirmed by DEC. DSEIS at p. 2-109.

Recent monitoring-well sample results show that the levels of contamination in some areas have remained well above the EPA drinking water limits for both strontium-90 and cesium-137. For example, extremely high levels of cesium-137 have been found in MW-42. In April 2006, cesium-137 was detected in MW-42 at 51,400 pCi/l, 257 times the drinking water limit of 200 pCi/l.[2] In addition, in October 2005, MW-111 detected

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[1] EPA limits for radionuclides in drinking water are as follows; Tritium, 20,000 pCi/l. Strontium-90, 8 pCi/l. Cesium-137, 200 pCi/1. Information on MCLs and health effects of radionuclides can be found on the EPA website at http://vww.epa.gov/rpdweb00/radionuclides/index.html , last accessed March 10, 2009. MCLs are also listed in *Radionuclides in Drinking Water, A Small Entity Compliance Guide,* U.S. EPA (February 2002).

[2] E-mail from James Noggle, NRC to Timothy Rice, DEC with attached NRC Data from Indian Pt. Split Monitoring Well Samples (August 23, 2007), annexed hereto as Exhibit 3.

the presence of 211,000 pCi/l of Tritium in groundwater on the site - - over 10 times the EPA standard for drinking water.[3] ER at 5-4. Moreover, according to the ER:

> [p]reliminary results indicate that tritium contaminated groundwater exists at the site. During the course of delineating the sources of tritium, Stontium-90, Cesium-137, and Nickel-63 have been detected in low concentrations in some onsite groundwater monitoring well samples.

ER at 5-4.

The topography of the land at Indian Point slopes from the plant toward the river. ER p 2-18. Indeed, "surface drainage is toward the Hudson River." Id. Any contaminated water will migrate into the Hudson River. Contaminated groundwater is migrating to the Hudson. In its ER, Entergy found that:

> [b]ased on the results of the preliminary hydrogeologic characterization of the site, Entergy has concluded that some contaminated groundwater has likely migrated to the Hudson River. This release pathway is now being monitored and is included in the site effluents offsite dose calculation.

ER at 5-4. Additionally, in a January 2007 internal Entergy memorandum discussing preliminary dose assessments from Sr-90 in Hudson River fish and invertebrates, the author concludes that following a conservative analysis of fish consumption based on the 24.5 pCi/kg of Sr-90 in the white perch sample from Roseton, the maximum individual annual dose would equal 44% of the annual allowable bone dose to an A adult male.[4] Additionally, other reports indicate that the chemicals in ground water at Indian Point include cobalt-60 and nickel-63, as well as tritium at 30 times the EPA drinking water limit. See Luby, Abby, "New Leaks Taint Hudson," Regional Report, March 2006.

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[3] The EPA's standard established under the Safe Drinking Water Act is 20,000 pCi/l.

[4] IPEC-CHM-07-002, Memorandum from S. Sandike, Sr. Chemistry Specialist to T. Bums, NEM Supervisor, re: "Dose Assessments from Sr-90 in the Hudson River for Fish and Invertebrates-January 2007 Results" (January 17, 2007), annexed hereto as Exhibit 4

ENTERGY'S ER AND THE NRC STAFF' DSEIS

Despite the fact that a the pilot desalination plant across the river from Indian Point will extract 170 to 300 gallons of river water per minute (244,800 to 432,000 gallons per day) for potable water and a fully operational facility built shortly thereafter would extract 10-15 million gallons per day to provide 7.5 million gallons per day of useable water to Rockland County, neither the ER nor the DSEIS mention this plan nor assess the impact on the quality of this water.

In fact, both explicitly ignore the impact of the known radioactive groundwater or potential future groundwater contamination on the quality of the Hudson River as a source of drinking water. In section 5.1 titled "New and Significant Information: Groundwater Contamination," Entergy concludes that groundwater is not used in the vicinity of the plant and that "[t]his is expected to be true during the IP2 and IP3 license renewal term." ER at 5-4 and 5-5. Entergy further asserts that:

> [b]ased on currently available information and the sampling data that have been analyzed and assessed to date, the NRC and Entergy have not found any condition that indicates that occupational or public health and safety have been, or likely will be, affected by the current onsite groundwater contamination. **This assessment is based on the fact that there is no drinking water pathway associated with** groundwater or **the Hudson River** in the region surrounding Indian Point…

Id. at 5-5 (emphasis added).

By improperly assuming that the Hudson River is not a source of drinking water, Entergy finds that there is no reason to study the impacts of the LRA on drinking water. Entergy concludes that:

> no NRC dose limits have been exceeded and EPA drinking water limits are not applicable since no drinking water pathway exists. Although impacts to site groundwater quality have occurred …. Entergy concludes that although the existence of radionuclides in the groundwater during the license renewal period are potentially a new issue, the impacts would be SMALL and not significant.

Id.

The NRC Staff also incorrectly concludes that "there is no drinking water exposure pathway to humans that is affected by the contaminated ground water conditions at the IP2 and IP3 site." DSEIS at 2-108. In analyzing the impact on the Hudson River the DSEIS also incorrectly concludes that "the only noteworthy pathway resulting from contaminated ground water migration to the river is through the consumption of fish and invertebrates from the Hudson River." DSEIS at 2-107. Indeed, the DSEIS incorrectly states that the "EPA drinking water limits are not applicable since no drinking water pathway exists." As set forth above, the leaks to groundwater at Indian Point have been significant and are also likely to increase during period of the renewal license from this aging facility.

ARGUMENT

I. Legal Requirements for Contentions

This section summarizes the four legal requirements for a contention; a specific statement of the contention, an explanation of basis, a demonstration that it is within the scope of the proceedings, and a demonstration of materiality. In addition, this section shows that the proposed new contention is within the scope of the proceeding and meets

the requirements for a new contention, because it was triggered by new and significant information.

A. Specific Statement of the Contention

In order to bring a contention before the Commissioners, Clearwater must "provide a specific statement of the issue of law or fact raised or controverted." 10 C.F.R. § 2.309 (f)(1)(i). The new contention is that

> The Environmental Report submitted by Entergy and Supplement 38 to Generic Environmental Impact Statement for License Renewal for Nuclear Plants, Regarding Indian Point Generating Units 2 and 3 (hereinafter referred to as "DSEIS") issued by the NRC Staff on December 22, 2008 fail to satisfy the requirements of NEPA, 42 U.S.C. §4332 *et seq.,* and NRC regulations implementing NEPA, because the ER and DSEIS do not assess the impacts of the license renewal on drinking water quality and drinking water degradation as it relates to the use of the Hudson River as a source of drinking water.

B. Issues Beyond Dispute

As recognized by the Atomic Safety and Licensing Board ("ASLB") in its decisions admitting the initial contention, Clearwater has ample basis for the following points, which are also included in the basis for the new contention:

i) there is a genuine dispute regarding the significance of the environmental impacts from the leaks LBP 08-13 at 192;
ii) sufficient information and expert opinion exist to raise the question whether Entergy's conclusions, contained in the ER regarding the significance of the groundwater contamination, are incomplete and legally insufficient for purposes of satisfying 10 C.F.R. Part 51 Id;
iii) There are serious factual differences between the positions of the Applicant and Petitioner regarding the radiological leaks. Id; and
iv) Clearwater has adequately demonstrated standing. Id at 5.

C. Basis of the Contention

At this preliminary stage, Clearwater does not have to submit admissible evidence to support their contention; rather it has to "provide a brief explanation of the basis for the contention," 10 C.F.R. § 2.309(f)(1)(ii), and "a concise statement of the alleged facts or expert opinions which support the petitioner's position." 10 C.F.R. § 2.309(f)(1)(v). This rule ensures that "full adjudicatory hearings are triggered only by those able to offer minimal factual and legal foundation in support of their contentions." Duke Energy Corp. (Oconoee Nuclear Station Units 1, 2, and 3), 49 N.R.C. 328, 334 (emphasis added). The Commission has clarified that, "an intervenor need not … prove its case at the contention stage… The factual support necessary to show a genuine dispute exists need not be in affidavit or formal evidentiary form, or by the quality necessary to withstand a summary disposition motion." In the Matter of Georgia Institute of Technology, 42 N.R.C. 111 (October 12, 1995).

All that is required for a contention to be acceptable for litigation is that it be specific and have a basis; whether or not the contention is sustainable is left to litigation on the merits in the licensing proceeding. Washington Public Power Supply System (WPPSS Nuclear Project No. 2), ALAB-722, 17 NRC 546, 551 n.5 (1983), citing Houston Lighting and Power Co. (Allens Creek Nuclear Generating Station, Unit 1), ALAB-590, 11 NRC 542 (1980).

Thus, although the Commission has stated that it "is unwilling to open its hearing doors to petitioners who have done little in the way of research or analysis, provide no expert opinion, and rest merely on unsupported conclusions," Duke Energy Corporation (McGuire Nuclear Station, Units 1 and Catawba Nuclear Station, Units 1 and 2), CLI-02-

17, 56 N.R.C. 1, 8 (2002), it has indicated that where petitioners make technically meritorious contentions based upon diligent research and supported by valid information, the requirement for an adequate basis is more than satisfied.

This new contention is based upon new information discussed above. In addition, Clearwater has performed independent and diligent research to establish that the desalination plants cannot effectively and economically extract the various radionuclides that have been found in contaminated water and fish in the Hudson River. *See generally* Greene Dec. Treatment performed by the desalination plant cannot remove the contaminants. As set forth in greater detail in the Greene Dec., tritium bonds with oxygen to form tritiated water and is chemically similar to H_2O and cannot be filtered from water. This is a source of public health concern and an environmental impact that must be assessed under NEPA. Based upon this new information Entergy and NRC Staff must evaluate the impact and the ASLB should not make a decision on the LRA until those reviews are completed.

The contention is based on the ER, the DSEIS, information previously submitted by parties to this LRA proceeding and found in the NRC Staff Hearing file, and the information contained above in the Background section relating to the migration of radioactive groundwater into the Hudson River. In addition, the contention is supported by investigations conducted by Entergy, including a January 2007 internal Entergy memorandum discussing preliminary dose assessments from Sr-90 in Hudson River fish and invertebrates, that concludes that following a conservative analysis of fish consumption based on the 24.5 pCi/kg of Sr-90 in the white perch sample from Roseton,

the maximum individual annual dose would equal 44% of the annual allowable bone dose to an adult male.

This contention is also based upon publicly available information from experts in drinking water quality, radiation and the effects of radiation on the environment and public health, See http://vww.epa.gov/rpdweb00/radionuclides/index.html and (NRC Fact Sheet on Tritium, Radiation Protection Limits, and Drinking Water) http://www.nrc.gov/reading-rm/doc-collections/fact-sheets/tritium-radiation-fs.html , visited on March 10, 2009. In addition, Clearwater bases this contention on the Certification of Joseph Mangano annexed to Clearwater's Petition to Intervene dated December 10, 2007 and the report, *Public Health Risks of Extending Licenses of the Indian Point 2 and 3 Nuclear Reactors,* (Radiation and Public Health Project, Revised December 7, 2007) (attached as Exhibit 4 to Mangano Decl. submitted as part of Clearwater's Petition to Intervene)("Public Health Risks"). This contention is also supported by exhibits attached hereto. Exposure to tritium, cesium -137 and strontium -90 impacts the environment and public health. Strontium-90 accumulates in the body and continued exposure via drinking water may damage the health of individuals, especially the young. Indeed, the EPA warns that people who drink water in excess of standards increase their risk of getting cancer. See http://www.epa.gov/OGWDW/radionuclides/basicinformation.html.

Entergy has plainly stated the levels of tritium in groundwater at IP are about 211, 000 pCi/l. This is clearly significant because it shows that contaminated water that is known to be 10 times above the acceptable EPA standards for safety has migrated or is in the process of migrating toward the Hudson River and because of the new information

that the Hudson River will be used as a municipal drinking water supply. As such, a complete review of the impact of leaks and planned releases on the quality of water in the Hudson River, including the health impacts of drinking that water must be performed.

D. The Scope of License Renewal Proceedings Includes the Subject Matter Raised in the Contention

The new potential contention concerns the environmental and public health impacts on the water quality and drinking water quality degradation of the Hudson River in the vicinity of IP. The ASLB held that a review of environmental issues in this proceeding set forth in 10 C.F.R. §§ 51.71(a) and 51.95(c) constitutes a proper contention for a hearing. LBP 08-13 at 14.

Moreover, "[c]ompliance with the environmental quality standards and requirements of the Federal Water Pollution Control Act (imposed by EPA or designated permitting states) is not a substitute for, and does not negate the requirement for NRC to weigh all environmental effects of the proposed action, including the degradation, if any, of water quality, and to consider alternatives to the proposed action that are available for reducing adverse effects." 10 C.F.R. § 51.71(d) (fn)(3). Neither Entergy's ER nor NRC Staff's DSEIS have met this requirement.

E. The New Contention Raises A Material Dispute

The regulations require petitioners to "[d]emonstrate that the issue raised in the contention is material to the findings the N.R.C. must make to support the action that is involved in the proceeding." 10 C.F.R. § 2.309(f)(1)(iv). A showing of materiality is not

an onerous requirement, because all that is needed is a "minimal showing that material facts are in dispute, indicating that a further inquiry is appropriate." Georgia Institute of Technology, CLI-95-12, 42 N.R.C. 111, 118 (1995); Final Rule, Rules of Practice for Domestic Licensing Proceedings – Procedural Changes in the Hearing Process, 54 Fed. Reg. 33,171 (Aug. 11, 1989).

The new contention raises a number of disputes. These disputes are material because they cut to the heart of relicensing proceedings, which are designed to ensure that the operation of the nuclear generating facility does not endanger the health, safety or the environment, and demonstrate that Indian Point cannot be operated without adversely affecting the health of the public that live in the vicinity of the plant. The new contention is also material because the NRC Staff must fully assess and adequately account for the risks associated with using the Hudson River water in the vicinity of IP 2 and IP 3 as a source of municipal drinking water. The failure to assess the impact of these risks violates NEPA's requirement that environmental decisions must contain an evaluation of those aspects of a proposed action that will affect the quality of the human environment "in a significant manner or to a significant extent not already considered." Marsh v. Oregon Natural Resources Council, 490 U.S. 360, 374 (1989) ("Marsh").

Both Entergy and NRC Staff state that the Hudson River is not a source of drinking water. Clearwater has presented clear evidence that the Hudson River, across the river from IP, will be a source of drinking water. Therefore a dispute exists, and as discussed above, the dispute is material.

As it is clear that the Hudson River will be used as a source of drinking water supply during the term of the license renewal, Entergy and the NRC Staff must broaden

their environmental assessments to determine the impact on drinking water quality and study the health impacts of drinking water containing the chemicals found in IP's groundwater contamination. Without this assessment neither Entergy nor the NRC satisfy the requirements set forth under NRC Rules and Regulations and NEPA.

F. This Request is Timely

This request is timely because the Board's oral order on January 14, 2009, memorialized in its written order dated February 4, 2009 provides intervenors in this license renewal proceeding 25 days from the date of the notice of the occurrence to file a new contention.

Additionally, Petitioners may add new contentions after filing their initial petition, so long as they act in accordance with 10 C.F.R. § 2.309(f)(2). Entergy Nuclear Vermont Yankee, L.L.C. (Vermont Yankee Nuclear Power Station), LBP-05-32, 62 NRC 813 (2005). The Commission's regulations allow for a "new contention" to be filed upon a showing that:

> (i) The information upon which the amended or new contention is based was not previously available;
> (ii) The information upon which the amended or new contention is based is materially different than information previously available; and
> (iii) The amended or new contention has been submitted in a timely fashion based on the availability of the subsequent information.

10 C.F.R. § 2.309(f)(2)(i)-(iii).

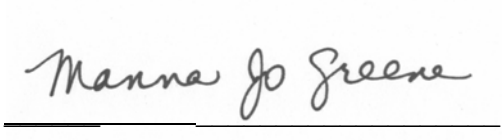
Here, as set forth above, Clearwater bases its new contention upon new information discovered on February 25, 2009. This information is materially different from information stating that the Hudson River is not a source of drinking water supply,

which was the previously available information. Finally, this motion is being filed on March 19, 2009, 22 days from the date that the new information was available.

Thus, like Vermont Yankee and in accordance with rulings in other proceedings, the ASLB should now find that the new contention meets the requirements of 10 C.F.R. § 2.309(f)(2)(i) and (ii) because it is based upon new information that was "not previously available," and is "materially different than information previously available."

CONCLUSION

For the foregoing reasons, the ASLB should grant leave for Clearwater to add the proposed new contention and admit the new contention into this proceeding.



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HUDSON RIVER SLOOP CLEARWATER, INC.'S PETITION TO FILE A NEW CONTENTION BASED UPON NEW INFORMATION

LIST OF EXHIBITS

Exhibit 1. NYS DEC letter dated January 26, 2009.

Exhibit 2. Map of Westchester County showing proximity of Indian Point to Potential Environmental Justice Areas (PEJA) in purple, with approximate location of United Water of NY's proposed desalination plant in Rockland County.

Exhibit 3. E-mail from James Noggle, NRC to Timothy Rice, DEC with attached NRC Data from Indian Pt. Split Monitoring Well Samples (August 23, 2007).

Exhibit 4 IPEC-CHM-07-002, Memorandum from S. Sandike, Sr. Chemistry Specialist to T. Bums, NEM Supervisor, re: "Dose Assessments from Sr-90 in the Hudson River for Fish and Invertebrates-January 2007 Results" (January 17, 2007).

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Division of Environmental Permits, 4th Floor
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Alexander B. Grannis
Commissioner

January 26, 2009

Re: Coordination to Establish SEQR Lead Agency
Proposed Long-Term Water Supply Project by United Water New York, Inc.
Town of Haverstraw, Rockland County
DEC #3-3922-0021

Dear Involved Agency:

The New York State Department of Environmental Conservation (DEC) has received a Joint Application for Permit from United Water New York Inc. (UWNY) for its proposed Long-term Water Supply Project (LTWSP), and by this letter is initiating review of that project under the New York State Environmental Quality Review Act (SEQR). DEC has also received a separate Joint Application for Permit from UWNY for a proposed pilot desalination plant (additional discussion below).

Proposed Long-Term Water Supply Project (LTWSP)

The UWNY LTWSP is a proposal to construct a desalination facility in the Town of Haverstraw, Rockland County, intended to produce potable water from the Hudson River. The LTWSP proposal includes a raw water intake unit which would be located along the Hudson River, near the former US Gypsum dock; a desalination facility which would be located upslope, on lands of the former Haverstraw landfill; and a raw water transmission line between the two facilities. The application for the LTWSP was accompanied by a preliminary draft of a proposed Environmental Impact Statement ("pre-draft EIS"). Based upon records provided by UWNY, a copy of the pre-draft EIS was already sent to you directly from UWNY, and so that document is not included in this mailing. Please advise my staff promptly if you have not already received the pre-draft EIS.

DEC has preliminarily classified the proposed LTWSP, as described in the Joint Application for Permit for the LTWSP and in the pre-draft EIS, as a Type I action under SEQR. Further, based on its concerns about potential impacts of statewide and regional importance from the LTWSP, including effects on natural resources of the Hudson River system, issues related to deployment of a technology which would be unique in New York State, and the implications of the proposed project for ongoing interstate water allocation discussions, DEC proposes to serve as lead agency for the SEQR review of this proposal. Assuming that DEC is confirmed as lead agency for this proposed project, it intends to treat the pre-draft EIS as an expanded environmental assessment form pursuant to 6 NYCRR 617.6(a)(4). Further, DEC intends to issue a positive declaration, requiring that the environmental review include an Environmental Impact Statement (EIS).

DEC also intends to conduct formal scoping to expand upon the pre-draft EIS submitted by UWNY. Specific topics that DEC has identified as needing additional study and discussion in the EIS for the LTWSP include, but are not limited to, the following:

- More detailed discussions of alternatives to desalination, specifically including implementation of enhanced water conservation and loss minimization measures;
- Quantification and comparison of water volumes needed to serve existing demands, projected build-outs under existing adopted plans and zoning, and opportunities to minimize future demands;
- Any design, management or impact mitigation implications for the proposed full-scale desalination operation based on data developed from operation of a proposed pilot desalination plant (further discussion below);
- Suitability of the former Haverstraw landfill site as the proposed LTWSP desalination plant site, addressing both physical and legal considerations;
- Legal and technical issues relating to use of waters classified as "SB" under 6 NYCRR 701.11 (see http://www.dec.ny.gov/regs/4592.html#15984) as the source of a potable water supply; and
- Environmental and regulatory information needs of all other involved agencies.

Based on an initial review of the Joint Application for Permit for the LTWSP and the accompanying pre-draft EIS, DEC staff have preliminarily determined that the following permits or approvals would be required from DEC to enable the proposed LTWSP to proceed:

- Water Supply permit (Environmental Conservation Law [ECL] Article 15, Title 15) - Required whenever a new water district is formed, or additional water is taken from a new source of supply. (DEC recognizes that the point of withdrawal for the proposed project is not now an approved source, as indicated in the note above on scoping.)
- Protection of Waters permit (ECL Article 15, Title 5) - Required for disturbance of the bed or banks of a protected waterbody.
- Excavation or Placement of Fill permit (ECL Article 15, Title 5) - Required for the placement of fill, or for excavation that occurs below the mean high water level of a navigable waterway.
- State Pollutant Discharge Elimination System permit (SPDES; ECL Article 17) - Required for wastewater discharges greater than 1000 gallons per day. The Joint Regional Sewage Treatment Plant has a current SPDES permit that may require modification if it is to receive discharges from the proposed LTWSP. A SPDES permit could also be required for discharges associated with dewatering which could be required during possible construction activities.
- State Pollution Discharge Elimination System Stormwater permit (ECL Article 17) - Required to control runoff from all LTWSP sites.
- Water Quality Certification (WQC; U.S. Clean Water Act, Section 401; 6 NYCRR Part 608) - DEC must review proposed activities requiring a federal permit under Section 404 of the U. S. Clean Water Act, and other federal authorities, to determine whether the proposed activity as authorized by the federal approval would satisfy NYS water quality

standards. Depending upon what permitting may be required from the U. S. Army Corps of Engineers for the LTWSP, a NYS WQC could be necessary.

The lead agency for the LTWSP must be established by **FEBRUARY 27, 2009**. I am requesting, however, that you please provide your response sooner, if possible. In your response, please specifically indicate whether you consent to DEC serving as lead agency, and provide an outline of your agency's jurisdiction(s) over UWNY's proposed LTWSP. Additionally, DEC is very interested in learning what resources, impacts, or issues your agency concludes should be addressed in developing a determination of significance. DEC would also like to receive your agency's preliminary identification of any studies or data which you would recommend be included as part of a fully-scoped draft EIS for the proposed project.

If we do not receive any response from you by February 27, 2009, we will assume that you concur with DEC serving as lead agency.

Proposed Pilot Desalination Plant

DEC has also received a Joint Application for Permit for a "pilot" desalination plant, with a stated purpose of gathering data in support of UWNY's application to develop its proposed LTWSP desalination project. UWNY has indicated to DEC that data from the pilot desalination plant is necessary for UWNY to proceed with design and reviews of its proposed LTWSP, to help establish parameters for operation as well as design of the LTWSP, and to provide DEC with information required for development of draft permits for the LTWSP.

Therefore, although DEC considers the pilot desalination plant to be a segment of the proposed LTWSP, DEC has concluded that regulatory review of the proposed pilot desalination plant may be segmented from review of the application for the LTWSP. The pilot desalination plant is being proposed only to gather data in support of design, regulatory applications and the draft EIS for the proposed LTWSP, and the pilot desalination plant is a temporary activity which is proposed to operate for no more than twelve to eighteen months.

DEC has, therefore, classified the proposed pilot desalination plant as a Type II action under SEQR, pursuant to 6 NYCRR 617.5(c)(18). This classification is supported by UWNY's representation that it intends to operate the pilot desalination plant for basic data collection in partial support of its application for the LTWSP, specifically including undertaking water quality, pollution, and engineering studies. Further, consistent with 6 NYCRR 617.3(g)(1), DEC concludes that its classification of the proposed pilot desalination plant as Type II, along with the direct incorporation into the draft EIS and public review process of the data developed through operation of that plant, will result in an environmental review of the entire project, as a whole, which is clearly no less protective of the environment than a single review. Further, the Type II classification of the proposed pilot desalination plant, and the integration of the pilot desalination plant's operational results and data into the draft EIS and SEQR public review process for the proposed LTWSP, does not commit the DEC to commence, engage in or approve the proposed LTWSP. A more detailed discussion of the status of the pending joint application for DEC

permits for the pilot desalination plant will be set forth in a separate letter to be sent to UWNY, with copies to other agencies having jurisdiction over the proposed pilot desalination plant.

We look forward to your response concerning lead agency status for and potential environmental issues related to the proposed LTWSP. Please address your responses directly to Jeremy Rosenthal of my staff, at the address above. Mr. Rosenthal is the project manager for the review of the proposed LTWSP and pilot desalination plant. If you have questions, please feel free to contact him at the telephone number above, or at jxrosent@gw.dec.state.ny.us

Sincerely,

Betty Ann Hughes

Betty Ann Hughes
Chief, SEQR & Training Unit
DEC Environmental Permits, Albany

To: Attached

DISTRIBUTION LIST

TO: Howard T. Phillips, Jr., Supervisor T-Haverstraw
Annette Torres, Secretary, Town of Haverstraw ZBA, Planning Board, Architectural Review Board
Alan C. Bauder, OGS
Honorable Jaclyn A. Brilling, PSC
Kenneth W. Caffrey, NYSDOH
Daniel Miller, Rockland Co. DOH
Andrew M. Conners, Rockland Co. Highway Dept.
Arlene Miller, Deputy Commissioner Rockland Co. Dept. of Planning
Philip A. Marino, Supervisor, T-Stony Point
Patrick Brady, Executive Director. Haverstraw Joint Regional Sewer Board
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Honorable Jaclyn A. Brilling, Secretary New York Public Service Commission
Ruth Pierpont, Director Bureau of Field Services, NYS OPRHP

ECC: William Janeway, Region 3 Director, NYS DEC
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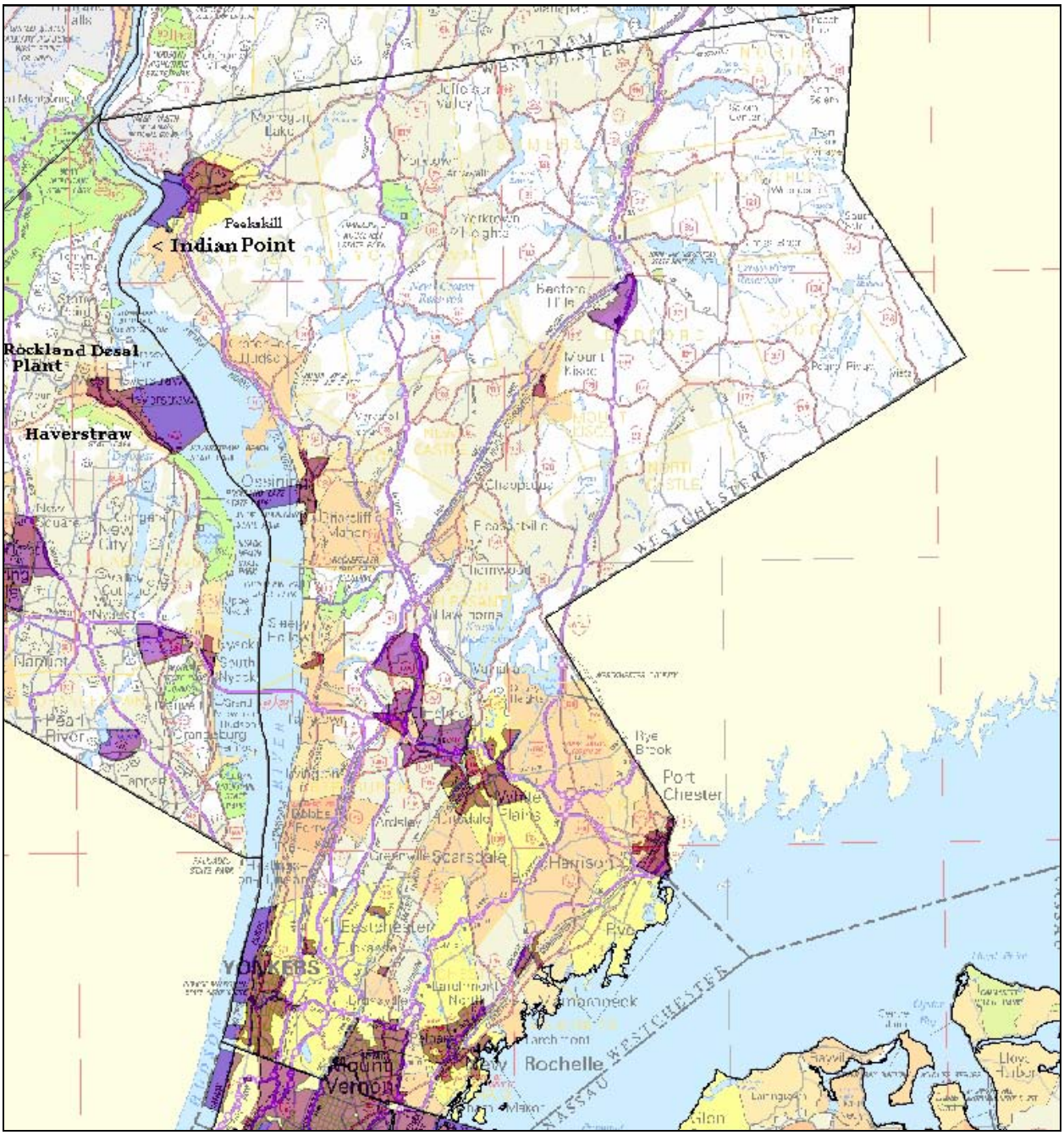
Margaret Duke, Regional Permit Administrator, Region 3, NYS DEC
Jack Issacs, Region 3, NYS DEC
Larry Wilson, Region 3, NYS DEC
Thomas Rudolph, Region 3, NYS DEC
Lawrence H. Weintraub, Esq., Counsel's Office, NYS DEC, Albany
Mike Holt, Division of Water, NYS DEC, Albany
Jeremy Rosenthal, Environmental Permits, NYS DEC, Albany

Exhibit 2. Map of Westchester County showing proximity of Indian Point to Potential Environmental Justice Areas (PEJA) in purple, with approximate location of United Water of NY's proposed desalination plant in Rockland County.



Courtesy of NYS DEC Office of Environmental Justice.

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From: James Noggle
To: Rice, Timothy
Date: 08/23/2007 4:10:59 PM
Subject: Fwd: NRC Data from Indian Pt. Split Monitoring Well Samples

FYI

B-84

ORISE Miscellaneous Sample Results (pCi/l for water or pCi/g for sed. or pCi/g wet wt. for veg. and fish) 8/08/07

A	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T
1																				
2																				
3	Sample ID	Sample Date	H-3	C-14	Sr-90	Cs-137	Co-60	Fe-55	Ni-59	Ni-63	Tc-99	Np-237	Pu-238	Pu-239/240	Pu-241	Am-241	Cm-242	Cm-243/244	U-234	U-238
4																				
5	U-2 MH-5	04/17/06	120±230	-9±16	0.12±0.46	1.0±2.8	1.7±2.3	16±35	21.5±6.3	-1.2±5.8	2±19	-0.03±0.05	0.13±0.10	-0.01±0.06	0±14	-0.07±0.13	0.04±0.05	-0.03±0.13	0.20±0.10	0.20±0.10
6	Hudson @MH 1 Discharge	04/18/06	-210±210	2±16	0.58±0.55	-3.6±4.0	1.1±2.2	-5±35	1.5±5.8	1.5±5.9	-1±19	0.01±0.04	0.10±0.10	0.05±0.04	6±14	0.05±0.10	0.01±0.05	-0.02±0.09	0.04±0.06	0.05±0.04
7	Sediment @ MH-1 Discharge	04/18/06	4.3±2.7	-0.3±1.3	0.01±0.13	0.06±0.04	0.00±0.04	Not Analyzed	-0.39±0.91	-0.05±1.1	0.25±0.18	0.00±0.01	0.03±0.02	0.01±0.01	4.2±3.5	0.06±0.04	0.09±0.04	0.14±0.05	0.48±0.07	0.56±0.08
8	U-1 Cont. Spray Sump Bottom Layer	05/03/06	1,880±310	-6±16	352±11	2,895±91	2.5±3.7	-58±28	-9.2±2.6	24.2±3.5	1.9±8.9	0.03±0.05	0.09±0.09	0.01±0.03	-2±13	-0.01±0.12	0.03±0.06	-0.01±0.11	0.43±0.12	0.51±0.13
9	U-1 Cont. Spray Sump Bulk Layer	05/03/06	1,800±310	1±16	349±11	2,870±90	-0.1±2.3	-43±28	-7.2±2.8	24.4±3.5	240±21	-0.06±0.06	0.07±0.10	0.00±0.05	2±15	0.01±0.11	0.01±0.06	0.00±0.09	0.41±0.13	0.41±0.12
10	U-2 MH-5	05/04/06	2,210±330	-15±16	0.18±0.56	0.1±2.7	-0.2±1.6	-60±28	-0.6±2.7	-1.4±2.8	10.7±9.2	-0.05±0.04	0.11±0.09	0.05±0.05	3±13	0.04±0.20	-0.14±0.13	0.02±0.15	0.32±0.11	0.33±0.11
11	Sediment@ Verplank	05/10/06	0.0±1.7	0.45±0.87	-0.02±0.10	0.21±0.03	0.01±0.02	Not Analyzed	0.70±0.95	-1.0±1.1	0.12±0.18	0.00±0.01	0.01±0.02	0.01±0.01	1.7±3.5	0.02±0.04	0.02±0.02	0.01±0.04	0.42±0.07	0.40±0.07
12	Sediment@ White Beach	05/10/06	0.8±1.7	0.59±0.86	0.01±0.11	0.01±0.01	0.03±0.02	Not Analyzed	-0.71±0.93	-0.5±1.1	0.03±0.18	0.00±0.01	0.01±0.02	0.01±0.01	4.6±4.0	0.01±0.04	-0.01±0.02	-0.02±0.03	0.26±0.05	0.34±0.06
13	Sediment@ Manitou	05/10/06	-0.4±1.5	0.51±0.82	0.12±0.12	0.10±0.02	-0.01±0.02	Not Analyzed	-1.26±0.90	-0.3±1.1	0.07±0.18	-0.01±0.02	0.00±0.03	0.00±0.02	1.3±6.2	-0.02±0.03	-0.01±0.01	-0.01±0.02	1.42±0.14	1.37±0.14
14	Sediment@ Lent's Cove	05/10/06	0.5±1.8	0.20±0.92	0.08±0.11	0.06±0.02	-0.01±0.03	Not Analyzed	-0.70±0.91	0.1±1.1	0.13±0.17	0.01±0.01	0.05±0.03	0.00±0.01	-0.3±4.0	0.02±0.04	0.01±0.02	0.01±0.04	1.53±0.16	1.41±0.15
15	LaFarge MW-1	06/06/06	150±230		-0.4±0.53	2.9±2.3	-0.8±2.3	-26±23	-19.8±5.9	5.1±7.2	23±19									
16	LaFarge MW-2	06/06/06	80±220		0.54±0.60	-1.4±3.5	-0.7±2.2	-9±23	-13.2±6.0	1.8±7.2	14±19									
17	LaFarge MW-3	06/06/06	190±230		-0.18±0.56	0.1±2.3	-1.7±2.4	-2±23	-8.3±6.0	-1.2±7.1	13±19									
18	Water @ Verplank	06/14/06				1.3±4.9	0.3±4.9													
19	Vegetation @ Verplank	06/14/06	36.4±8.0		-0.01±0.01	0.15±0.13	0.08±0.10		-0.02±0.02	0.02±0.03										
20	Water @ Lent's Cove	06/14/06				0.4±7.1	3.6±7.5													
21	Vegetation @ Lent's Cove	06/14/06	22.9±4.1		0.00±0.04	0.06±0.04	-0.01±0.03		-0.18±0.07	0.08±0.12										
22	Discharge Canal	08/07/06	-50±200	0.1±9.0	0.20±0.45	1.3±1.5	-1.4±2.4	8±28	-13.3±5.4	10.5±8.7	4.3±9.3	0.00±0.02	0.05±0.04	0.03±0.03	2±12	0.08±0.05	0.02±0.03	0.03±0.03	0.14±0.07	0.17±0.08
23	Fish-Perch @ Indian Point	09/15/06			0.01±0.01	0.00±0.00	0.00±0.00													
24	Fish-Catfish @ Indian Point	09/15/06			0.01±0.01	0.01±0.01	0.01±0.01													
25	LaFarge MW-1	09/19/06	-94±230	0.5±9.7	0.10±0.52	1.2±2.1	3.8±2.9	-6±19	1.0±5.1	0.3±8.2	-2.7±9.0	0.00±0.01	0.01±0.03	0.03±0.02	-2.7±7.9	0.03±0.04	0.00±0.03	-0.02±0.04	0.87±0.10	0.73±0.11
26	LaFarge MW-2	09/19/06	-220±230	1.4±9.7	0.97±0.55	0.5±2.2	2.2±4.6	-1±19	-0.7±5.1	2.0±8.3	-0.5±9.1	0.00±0.04	0.04±0.05	0.03±0.03	-6.4±7.8	-0.02±0.05	0.00±0.03	0.00±0.03	28.3±2.1	17.1±1.4
27	LaFarge MW-3	09/19/06	-40±240	8.3±9.8	-0.17±0.45	-0.7±1.6	0.7±1.6	2±19	-17.4±4.9	2.6±8.3	2.8±9.1	-0.06±0.04	0.03±0.03	0.00±0.02	-2.5±8.2	0.02±0.03	0.01±0.02	0.00±0.01	0.56±0.12	0.48±0.10
28	LaFarge MW-1	12/04/06	-50±220	7.9±9.6	0.32±0.52	-0.6±2.2	0.5±2.5	0±18		-1.8±6.2	1.6±8.9	-0.10±0.19	-0.10±0.24	0.16±0.12	14±30	0.00±0.19	0.09±0.11	0.09±0.17	2.88±0.54	2.68±0.51
29	LaFarge MW-2	12/04/06	-80±220	3.7±9.4	0.36±0.48	-2.2±4.2	0.5±2.0	5±18		2.7±8.3	8.9±9.1	-0.10±0.21	0.14±0.15	0.04±0.08	-1±31	0.08±0.25	-0.02±0.15	0.02±0.21	24.6±2.4	18.2±1.7
30	LaFarge MW-3	12/04/06	130±230	5.0±9.5	0.13±0.48	-0.2±1.6	2.0±1.6	-2±16		-1.1±6.3	10.2±9.2	-0.35±0.20	0.12±0.17	0.05±0.09	3±30	0.10±0.11	0.10±0.09	-0.08±0.09	0.98±0.29	0.68±0.24
31	RO-18	12/05/06	110±210	0±12	-0.10±0.37	0.2±3.1	0.9±2.4	1±19		1.9±5.7	-1.8±8.1	0.02±0.08	0.07±0.20	-0.02±0.03	3±35	0.11±0.18	0.00±0.09	0.07±0.17	0.14±0.11	0.06±0.09
32	RO-543@50'	12/05/06	260±220	4±12	0.18±0.39	-0.4±2.1	0.8±2.2	-5±19		1.4±5.7	6.4±8.3	-0.02±0.08	-0.02±0.20	-0.04±0.07	28±34	0.17±0.21	-0.02±0.10	0.08±0.16	0.65±0.27	0.45±0.19
33	RO-543@95'	12/05/06	200±210	4±12	0.29±0.36	-1.8±4.3	0.4±2.2	8±20		-5.0±5.5	5.0±8.3	0.02±0.08	-0.02±0.18	-0.02±0.06	-13±35	0.20±0.19	0.05±0.08	0.03±0.08	1.31±0.35	0.78±0.26
34	Ft. Montgomery	12/05/06	50±200	8±12	-0.08±0.34	2.3±2.5	0.9±1.7	4±20		0.4±5.6	2.7±8.2	0.04±0.08	0.00±0.08	0.04±0.06	8±33	0.03±0.11	-0.02±0.09	0.07±0.10	-0.04±0.19	0.31±0.19
35	P-1217	12/06/06	60±200	4±12	0.09±0.39	-1.6±2.0	0.8±2.2	-4±19		2.3±5.7	3.4±8.2	0.00±0.08	0.08±0.22	0.00±0.05	8±33	0.05±0.11	-0.05±0.11	-0.12±0.16	0.21±0.25	0.08±0.09
36																				
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NOTE: Reported uncertainties are ± two sigma total propagated uncertainties.

ORISE Results for Onsite Wells (pCi/l) (8/8/07)

A	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R
1																		
2																		
3	Sample ID	Sample Date	H-3	C-14	Sr-90	Cs-137	Co-60	Fe-55	Ni-59	Ni-63	Tc-99	Np-237	Pu-238	Pu-239/240	Pu-241	Am-241	Cm-242	Cm-243/244
4																		
5	MW-111	09/29/05	216,800±2,800		1.4±1.2	0.9±2.9	3.5±3.1											
6	MW-111	10/14/05	7,290±410		1.1±1.3	-2.1±3.6	1.8±2.2											
7	MW-101	12/08/05	70±120		0.2±1.1	-1.4±5.3	2.5±3.6											
8	MW-105	12/08/05	-10±120		-0.2±1.2	0.4±2.9	1.5±3.3											
9	MW-107	12/08/05	130±120		0.8±1.2	-1.1±2.4	-0.2±2.8											
10	MW-38	12/08/05	740±130		0.4±1.2	-0.7±3.0	0.3±3.3											
11	MW-30	02/07/06	491,400±5,100		0.7±1.0	-0.5±5.2	1.0±5.9											
12	MW-31	02/07/06	32,910±470		0.2±1.1	1.2±5.2	-4.4±6.4											
13	MW-32	02/07/06	17,900±310		0.2±1.1	-1.3±5.2	-1.6±5.8											
14	MW-33	02/07/06	222,700±2,400		1.0±1.2	-0.1±4.5	1.8±4.8											
15	MW-34	02/07/06	174,700±1,900		0.3±1.0	-1.7±5.3	1.3±5.4											
16	MW-35	02/07/06	84,530±990		-0.1±1.1	-4±11	5.9±5.9											
17	MW-36	02/07/06	21,710±350		2.4±1.2	-6±10	4.2±6.6											
18	MW-111	02/07/06	242,400±2,600		1.9±1.2	3.7±5.3	3.0±5.7											
19	MW-38	02/08/06	310±130		0.4±1.0	-0.1±4.9	0.6±5.4											
20	MW-48	02/08/06	70±120		0.6±1.1	-2±10	4.3±6.2											
21	MW-37@22'	02/28/06	14,470±360		2.3±1.2	-0.4±4.8	5.4±5.6						-0.11±0.22	0.16±0.11		0.00±0.28	0.13±0.13	-0.06±0.17
22	MW-37@32'	02/28/06	29,720±560		26.4±2.1	0.4±4.8	7.2±5.3						0.09±0.20	0.04±0.10		0.11±0.24	0.00±0.10	0.11±0.23
23	MW-37@40'	02/28/06	15,990±390		21.8±1.8	1.1±4.2	1.2±4.8						-0.02±0.22	0.05±0.07		0.30±0.31	0.12±0.21	0.13±0.24
24	MW-37@57'	02/28/06	15,850±380		25.5±2.1	3.8±6.0	-4.3±6.3						-0.12±0.18	0.04±0.11		-0.20±0.21	0.30±0.20	-0.04±0.15
25	MW-37@22'	03/10/06	22,950±490		4.9±1.3	2.3±2.9	-1.7±3.1			5±11								
26	MW-37@32'	03/10/06	28,840±570		21.6±2.0	-1.1±2.4	-1.7±2.6			3±11								
27	MW-37@40'	03/10/06	16,140±400		17.6±1.9	2.7±3.1	2.2±3.2			-1±11								
28	MW-37@57'	03/10/06	15,940±390		26.6±2.2	2.5±3.6	-1.1±3.9			5±11								
29	MW-49@25'	03/22/06	14,240±740		16.7±1.3	3.2±2.1	-0.5±2.3	-48±72	3.4±5.2	6.3±5.4	-1±18	-0.24±0.32	0.65±0.48	0.14±0.31	-42±74	0.38±0.47	0.08±0.21	-0.41±0.38
30	MW-49@42'	03/22/06	9,130±580		22.5±1.4	0.1±1.7	1.4±2.0	-30±72	7.3±5.3	5.6±5.4	1±18	0.10±0.15	0.40±0.41	0.03±0.11	8±79	0.31±0.41	0.04±0.18	0.00±0.38
31	MW-49@65.5'	03/22/06	6,290±490		21.5±1.5	0.3±2.3	-4.0±2.4	-33±72	2.0±5.2	7.9±5.5	-7±18	0.16±0.23	0.20±0.47	0.20±0.18	-18±83	0.19±0.51	-0.08±0.19	0.12±0.40
32	MW-50@42'	03/22/06	8,190±550		24.5±1.8	1.2±2.3	-1.0±2.7	-14±72	4.2±5.2	5.4±5.4	-3±18	0.31±0.21	0.51±0.48	0.03±0.15	8±77	0.08±0.52	0.04±0.13	-0.19±0.41
33	MW-50@67'	03/22/06	9,490±590		30.6±1.7	-1.8±4.1	3.1±2.7	-10±72	-2.4±5.0	9.9±5.5	-6±18	0.00±0.19	0.46±0.47	0.08±0.24	39±78	0.19±0.45	-0.08±0.16	0.08±0.33
34	MW-36@26'	03/23/06	35,100±1,300		1.69±0.60	0.2±1.9	0.2±1.8	-39±72	-3.9±5.0	67.3±8.0	6±18	0.29±0.30	0.37±0.44	0.29±0.22	-12±80	0.32±0.30	-0.04±0.18	-0.08±0.32
35	MW-36@52'	03/23/06	28,900±1,100		5.71±0.78	1.0±4.4	3.3±3.1	-44±72	-0.3±5.1	10.3±5.5	14±19	-0.34±0.30	0.15±0.42	0.08±0.19	0±79	0.82±0.68	0.25±0.31	0.06±0.38
36	MW-42@49'	03/23/06	2,290±340		60.5±2.7	4,770±150	58.7±5.7	-19±72	71.9±7.8	1,392±86	-6±18	-0.20±0.29	0.20±0.40	0.16±0.30	15±78	-0.04±0.45	-0.16±0.16	-0.04±0.39
37	MW-36@41'	03/24/06	56,200±1,800		4.04±0.79	-1.3±2.2	-0.4±2.4	24±73	0.1±5.1	47.4±7.0	9±19	-0.11±0.27	0.11±0.43	0.00±0.18	-29±78	0.14±0.41	0.00±0.15	-0.04±0.28
38	MW-42@78'	03/24/06	510±250		0.37±0.45	33.1±5.1	1.7±2.3	-36±72	2.8±5.2	53.4±7.3	-14±18	0.33±0.29	0.33±0.45	0.06±0.26	8±84	0.12±0.32	-0.15±0.22	0.12±0.30
39	MW-42@41'	04/07/06	1,860±310	6±16	175.9±6.3	49,200±1,600	70±30	18±34	-321±13	5,730±350	8±19	-0.01±0.05	0.13±0.08	0.04±0.05	-3±14	0.09±0.15	0.01±0.08	0.03±0.09
40	MW-42@43'	04/07/06	2,050±320	-6±16	161.6±5.8	51,400±1,600	57±17	118±37	1±13	5,910±370	5±18	-0.04±0.05	0.14±0.08	0.06±0.06	-1±14	0.08±0.17	0.00±0.09	0.02±0.13
41	MW-42@45.5'	04/07/06	2,030±320	-1±16	149.0±5.4	51,400±1,700	63±25	-4±33	-88±10	5,980±370	3±18	0.00±0.04	0.09±0.08	-0.01±0.05	4±14	0.05±0.13	0.01±0.06	-0.11±0.10
42	MW-42@48'	04/07/06	1,880±320	-4±16	146.7±5.3	52,500±1,700	39±26	-9±33	-423±16	6,740±420	1±18	0.03±0.04	0.18±0.09	0.05±0.05	-2±14	0.07±0.14	0.01±0.06	0.04±0.12
43	MW-42@51'	04/07/06	2,160±330	1±16	184.4±6.4	35,900±1,200	63±24	0±33	-220±10	5,260±320	11±19	0.01±0.04	0.08±0.07	0.03±0.05	-6±14	-0.03±0.15	-0.07±0.07	-0.10±0.14
44	MW-42@78'	04/07/06	340±240	-4±16	0.63±0.75	61±17	1±10	-6±33	10.3±6.3	18.9±6.5	13±19	0.01±0.04	0.08±0.09	-0.01±0.05	-2±21	0.08±0.16	0.00±0.09	-0.05±0.17
45	MW-40@200'	04/11/06	100±230	16±16	0.34±0.49	2.0±4.4	2.3±2.1	6±35	4.8±5.9	4.2±5.9	2±19	0.01±0.05	0.00±0.08	0.03±0.05	4±14	0.01±0.08	0.04±0.04	-0.03±0.08
46	MW-51@200'	04/11/06	160±230	17±16	0.14±0.46	0.9±2.4	-0.4±2.1	-4±35	-0.9±5.7	6.1±6.0	4±19	0.06±0.05	0.13±0.09	0.02±0.06	0±15	0.02±0.09	0.01±0.03	0.05±0.07
47	MW-41@41'	04/12/06	490±250	8±16	3.72±0.65	0.6±2.0	0.1±2.6	-3±35	10.6±6.0	0.4±5.6	-4±18	-0.03±0.03	0.08±0.11	0.02±0.04	-2±16	0.02±0.13	0.00±0.03	-0.02±0.11
48	MW-41@63'	04/12/06	440±250	3±16	5.01±0.81	2.1±2.1	0.3±2.3	21±38	5.1±5.9	2.9±5.9	1±19	0.02±0.05	0.17±0.10	0.06±0.05	6±15	0.08±0.18	0.02±0.07	-0.02±0.11
49	MW-43@28'	04/12/06	230±230	8±16	-0.09±0.46	0.3±2.2	-0.6±2.6	-12±35	6.1±5.9	3.5±5.9	5±19	0.00±0.04	0.16±0.08	-0.01±0.05	-5±14	0.07±0.10	0.00±0.04	-0.02±0.08
50	MW-43@62'	04/12/06	40±220	17±16	1.30±0.55	0.0±1.6	0.6±1.7	14±35	8.1±5.9	1.1±5.9	6±19	-0.05±0.06	0.00±0.08	0.02±0.05	-3±22	-0.05±0.09	0.00±0.04	0.03±0.08
51	MW-46@30'	04/12/06	1,510±300	0±16	1.23±0.50	-0.2±4.1	3.1±3.2	-5±35	6.0±5.9	3.1±5.9	6±19	0.03±0.05	0.07±0.09	0.07±0.06	-4±13	0.07±0.18	0.06±0.07	0.04±0.12
52	MW-48@37.5'	04/12/06	90±230	11±16	0.49±0.48	0.5±1.9	0.0±2.0	11±35	8.8±5.9	1.7±5.9	10±19	0.01±0.05	0.01±0.08	0.04±0.06	-10±14	0.14±0.11	0.00±0.03	0.05±0.08
53	MW-48@52'	04/12/06	220±230	1±16	0.46±0.46	0.9±2.1	0.5±2.3	9±35	3.9±5.8	3.6±5.9	-6±18	-0.01±0.02	0.09±0.08	0.04±0.04	-9±13	0.07±0.07	-0.03±0.04	-0.02±0.06
54	MW-47@56'	04/13/06	280±240	-5±16	1.19±0.54	-0.1±2.5	1.9±2.3	25±36	8.9±5.9	-0.2±5.8	-8±18	0.00±0.02	0.06±0.08	0.04±0.04	2±14	-0.06±0.15	0.03±0.06	0.03±0.13
55	MW-47@80'	04/13/06	1,980±320	0±16	4.08±0.74	0.6±2.2	1.4±2.5	-1±35	2.0±5.8	3.8±5.9	13±19	0.02±0.04	0.05±0.11	0.06±0.04	2±14	0.01±0.14	0.01±0.08	-0.04±0.12

NOTE: Reported uncertainties are ± two sigma total propagated uncertainties

ORISE Results for Onsite Wells (pCi/l) (8/8/07)

A	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R
56	Sample ID	Sample Date	H-3	C-14	Sr-90	Cs-137	Co-60	Fe-55	Ni-59	Ni-63	Tc-99	Np-237	Pu-238	Pu-239/240	Pu-241	Am-241	Cm-242	Cm-243/244
57	MW-48@23'	06/09/06	220±230		-0.02±0.56	5.3±3.9	2.2±2.1	-1±23	-8.2±6.0	-1.2±7.1	14±19							
58	MW-48@38'	06/09/06	80±220		0.71±0.55	2.8±2.2	0.1±2.2	2±23	-11.9±6.0	1.9±7.2	9±19							
59	IW-48 River Fro	06/09/06	190±230		-0.11±0.53	6.0±3.1	0.4±1.6	-21±23	-5.9±6.1	-0.2±7.1	24±19							
60	MW-40@200'	06/20/06	150±230		0.96±0.82	1.0±2.3	1.8±2.5	-8±24	4.6±4.4	-1.8±5.5	3±18							
61	MW-38@40'	06/21/06	840±270		-0.68±0.93	1.4±2.1	-2.0±3.2	-4±24	-1.5±4.3	2.4±5.6	7±18							
62	MW30@78'	06/22/06	304,100±8,400		-0.40±0.75	45.6±4.0	1.3±1.6	-4±24	0.0±4.3	12.3±5.8	10±18							
63	MW-30@83'	06/22/06	189,100±5,300		0.40±0.72	60.1±5.3	1.8±2.5	9±24	3.4±4.4	12.2±5.8	14±18							
64	MW-30@72'	06/23/06	396,000±11,000		0.33±0.77	2.1±5.3	-1.5±4.3	-2±24	4.6±4.4	9.3±5.8	5±18							
65	MW-30@74'	06/23/06	397,000±11,000		0.34±0.81	26.5±4.1	0.1±3.2	-9±24	-0.3±4.3	12.0±5.8	18±18							
66	MW-49@25'	07/12/06	12,740±690	6.7±9.1	16.0±1.7	0.3±2.3	1.1±2.5	28±28	-9.5±4.8	11.1±7.7	10.0±9.0							
67	MW-49@42'	07/12/06	8,060±540	6.8±9.1	22.9±1.9	2.0±4.6	-1.7±3.5	30±28	-20.2±4.7	19.0±7.9	-0.8±8.7							
68	MW-49@51'	07/12/06	30±210	3.4±9.1	0.24±0.86	-0.1±2.0	2.0±1.6	31±28	-8.1±4.9	4.8±7.5	8.9±8.9							
69	MW-49@65'	07/12/06	4,780±430	1.6±9.0	18.0±1.7	-0.1±2.1	0.2±2.1	26±28	-9.7±4.8	10.0±7.7	9.4±9.0							
70	MW-49@25'	08/01/06	12,880±740	-2.8±9.0	11.7±1.0	0.2±1.6	0.8±1.6	-9±25	-8.8±5.5	12.3±8.7	-6.3±9.0	-0.05±0.06	-0.04±0.08	0.01±0.05	-2±14	0.08±0.08	0.03±0.03	0.01±0.06
71	MW-49@42'	08/01/06	8,360±580	-3.5±8.9	19.7±1.4	-2.1±4.5	0.3±2.2	9±26	-13.3±5.4	13.5±8.8	-8.6±9.0	-0.14±0.10	0.03±0.09	-0.01±0.08	5±14	0.06±0.11	-0.01±0.05	0.00±0.08
72	MW-49@65'	08/01/06	4,650±430	2.6±9.0	16.3±1.2	0.5±2.1	0.9±2.3	2±25	-16.2±5.4	13.8±8.8	-8.5±9.0	0.01±0.02	0.05±0.07	0.00±0.04	-1±13	0.10±0.10	0.02±0.02	0.05±0.07
73	MW-50@42'	08/01/06	270±220	0.4±9.0	4.75±0.77	-2.6±4.5	2.1±2.1	8±26	-15.0±5.4	10.5±8.7	0.1±9.2	-0.01±0.02	0.05±0.08	0.04±0.04	-7±14	0.03±0.09	-0.02±0.06	-0.02±0.07
74	MW-50@67'	08/01/06	8,170±570	5.2±9.1	30.0±1.7	2.0±2.5	0.7±2.8	11±26	-16.1±5.4	14.0±8.8	-3.9±9.1	-0.12±0.08	0.05±0.07	-0.02±0.07	-4±13	0.02±0.08	0.01±0.04	0.02±0.06
75	MW-58@71	08/02/06	210±220	-1.0±9.0	0.65±0.51	1.1±2.1	3.0±2.3	-5±25	-15.9±5.4	11.7±8.7	-5.4±9.1	-0.07±0.06	0.01±0.07	-0.01±0.05	-10±12	-0.02±0.07	-0.01±0.04	-0.08±0.08
76	MW-38	08/07/06	190±220	2.6±9.0	0.37±0.45	3.8±2.3	-0.5±2.8	-12±25	-7.7±5.5	7.3±8.6	-4.0±9.1	-0.08±0.06	0.03±0.05	0.04±0.05	-4±12	0.06±0.07	0.03±0.04	0.00±0.00
77	MW-40	08/09/06	220±220	3.1±9.1	1.2±1.1	-0.6±1.9	0.4±1.7	-12±25	-9.4±5.5	10.8±8.7	-5.2±9.1	-0.13±0.09	0.03±0.06	0.01±0.05	8±13	0.02±0.08	-0.02±0.02	0.00±0.06
78	MW-30@74'	08/18/06	259,200±8,700	-5±10	1.0±1.1	10.6±4.6	4.7±4.2	9±28	-16±13	15±22	2±19	-0.07±0.14	0.42±0.40	0.10±0.15	16±31	0.11±0.34	0.04±0.17	0.04±0.24
79	MW-30@88'	08/22/06	14,610±580	-4±10	0.5±1.1	2.3±2.9	-2.7±3.2	7±28	-9±13	8±22	7±19	-0.04±0.13	0.19±0.37	0.23±0.19	27±31	0.08±0.24	0.19±0.17	0.00±0.15
80	MW-53@80'	08/23/06	13,260±540	-4±10	8.61±0.73	0.1±1.6	1.5±1.7	10±28	-6.9±5.2	9.1±8.7	1.9±9.3	0.00±0.05	-0.10±0.18	0.05±0.08	7±16	0.06±0.08	0.02±0.04	-0.04±0.05
81	MW-57@45'	08/24/06	4,200±240	-4±10	21.8±1.2	2.2±3.9	0.2±2.2	-13±28	-10.1±5.1	7.9±8.7	7.8±9.5	0.04±0.09	0.22±0.18	0.04±0.05	6±15	0.02±0.14	0.08±0.10	0.06±0.13
82	MW-55@78'	08/25/06	16,700±650	0±11	28.2±1.3	3.7±2.7	1.2±2.2	9±28	-2.8±5.3	7.7±8.7	3.1±9.4	-0.10±0.09	0.14±0.19	0.06±0.07	11±15	0.07±0.15	-0.02±0.08	0.06±0.08
83	MW-53@120'	08/30/06	4,320±250	3±11	16.9±1.0	1.4±3.3	1.4±2.4	7±28	-1.6±5.3	12.4±8.8	6.8±9.5	-0.04±0.10	0.11±0.17	0.09±0.09	4±14	-0.07±0.21	-0.02±0.06	-0.11±0.15
84	MW-54@206'	09/07/06	2,180±350	-2±11	14.8±1.2	0.6±1.6	1.0±1.8	-15±19	-3.3±5.0	5.9±8.4	-1.2±9.0	0.04±0.10	0.13±0.19	0.05±0.10	15±15	0.00±0.12	0.10±0.10	0.00±0.12
85	MW-56@85'	09/08/06	900±290	1±11	2.96±0.76	8.1±3.0	2.8±2.2	-10±19	-9.3±4.9	5.2±8.3	3.5±9.2	0.04±0.08	0.06±0.14	0.12±0.10	17±16	0.04±0.13	-0.06±0.13	0.04±0.10
86	MW-65@80'	09/08/06	-120±230	-2±11	0.56±0.49	0.2±2.2	0.3±2.4	-15±19	-2.6±5.0	3.2±8.3	-1.8±9.0	-0.02±0.08	0.11±0.13	0.00±0.05	3±14	0.04±0.15	0.00±0.06	0.04±0.10
87	MW-42@40'	09/15/06	1,500±320	0.2±9.6	32.8±2.4	20,260±650	11.7±9.9	-3±19	15±13	1207±85	-1±18	0.03±0.06	0.11±0.08	0.01±0.03	-10±16	0.04±0.08	0.03±0.06	-0.03±0.07
88	MW-42@48'	09/15/06	1,370±310	-0.6±9.6	35.0±2.3	21,650±750	15±11	-2±19	-73±12	1272±89	5±18	-0.04±0.05	-0.01±0.07	0.03±0.06	-10±15	0.06±0.07	0.03±0.03	0.01±0.07
89	MW-59@70'	09/15/06	130±250	6.9±9.8	0.14±0.50	-3.8±4.1	0.3±4.1	-4±19	2.0±5.1	-0.4±8.2	-4.7±8.9	0.02±0.02	0.04±0.03	0.04±0.03	-2.5±9.3	0.00±0.05	0.02±0.02	-0.01±0.04
90	MW-42@41'	09/18/06	2,830±380	0.8±9.7	20.2±2.0	13,730±470	4±13	-19±19	-72±12	452±40	4±18	0.01±0.02	0.08±0.09	0.03±0.04	-3±17	0.03±0.09	0.01±0.04	0.01±0.08
91	MW-42@43'	09/18/06	2,350±360	8.8±9.8	15.7±1.7	15,140±510	3±12	-17±19	3±13	435±39	8±18	0.01±0.02	0.06±0.13	0.01±0.04	-8±16	0.07±0.09	0.07±0.06	0.01±0.09
92	MW-53@80'	11/09/06	570±240	-4.9±9.4	-0.18±0.34	0.3±2.1	0.3±2.1	19±19	-9.2±4.2	5.8±5.8	0.3±8.1	0.00±0.05	0.09±0.20	0.05±0.08	-21±32	0.17±0.20	0.11±0.13	-0.04±0.12
93	MW-53@120'	11/09/06	8,210±570	0.5±9.5	34.3±1.5	0.3±1.9	2.8±1.7	22±19	-10.9±4.1	27.7±6.5	-0.6±8.1	-0.06±0.11	0.19±0.19	0.07±0.08	-1±33	0.11±0.16	0.05±0.12	0.04±0.05
94	MW-55@24'	11/09/06	1,890±310	-1.1±9.5	18.8±1.0	1.3±4.2	0.7±2.1	13±18	-6.8±4.2	3.1±5.8	-3.3±8.0	0.10±0.09	-0.21±0.20	0.08±0.09	2±35	0.06±0.10	0.00±0.04	0.01±0.10
95	MW-55@35'	11/09/06	9,450±620	4.3±9.6	43.6±1.8	1.6±2.2	-0.1±2.4	-5±18	-4.3±4.2	3.8±5.8	-2.7±8.1	0.02±0.08	0.12±0.19	0.02±0.06	39±30	-0.03±0.13	0.03±0.06	0.06±0.12
96	MW-55@54'	11/09/06	12,840±750	7.2±9.6	34.8±1.8	1.2±1.7	0.4±1.8	4±19	-1.5±3.6	9.6±5.4	-4.5±8.0	0.00±0.08	0.25±0.28	0.02±0.04	25±30	0.09±0.13	0.03±0.06	-0.05±0.11
97	MW-56@85'	11/09/06	210±220	1.3±9.5	-0.02±0.60	0.4±5.1	3.6±3.1	-4±18	2.9±3.7	1.2±5.2	1.1±8.2	0.04±0.08	0.00±0.06	0.08±0.08	34±30	0.11±0.18	0.00±0.11	0.02±0.12
98	MW41@42'	11/13/06	600±240	-11.1±9.3	3.45±0.48	-1.2±3.5	1.1±2.1	15±18	-7.1±4.2	2.4±5.8	-1.6±8.1	0.00±0.05	-0.18±0.20	0.02±0.08	-5±36	-0.02±0.17	0.04±0.13	0.00±0.11
99	MW41@64'	11/13/06	300±220	-7.8±9.3	2.12±0.43	0.9±2.1	2.8±2.3	16±18	-7.0±4.2	2.9±5.8	-3.0±8.1	0.02±0.04	0.02±0.23	-0.02±0.09	-15±34	0.04±0.19	0.00±0.10	0.02±0.07
100	MW45@43'	11/13/06	710±250	2.5±9.5	0.02±0.72	0.5±1.5	-0.1±1.6	16±18	-8.8±4.2	4.7±5.8	0.7±8.1	0.02±0.04	0.14±0.11	0.02±0.04	6±34	0.07±0.17	0.08±0.10	-0.07±0.09
101	MW45@62'	11/13/06	1,140±270	-2.5±9.4	0.21±0.34	1.9±3.5	1.9±2.2	-1±18	-12.8±4.1	5.0±5.8	4.0±8.2	0.05±0.09	0.10±0.19	0.09±0.09	7±36	0.02±0.17	0.00±0.06	0.04±0.13
102	MW49@26'	11/15/06	9,070±610	0.5±9.5	15.27±0.92	-1.5±3.5	2.4±2.5	-11±18	-2.3±2.6	7.9±5.3	-2.7±8.1	-0.02±0.09	0.15±0.24	0.09±0.11	14±28	0.22±0.21	0.10±0.17	0.04±0.22
103	MW-49@42'	11/15/06	6,300±500	-0.4±9.5	23.6±1.3	1.8±2.1	1.9±2.4	2±19	2.3±3.7	4.7±5.2	-3.8±8.0	0.06±0.09	0.06±0.21	0.12±0.11	16±30	0.08±0.15	0.11±0.11	0.02±0.08
104	MW-49@65'	11/15/06	3,590±390	-1.6±9.4	19.6±1.1	0.4±1.5	0.6±1.9	-6±18	-5.5±3.6	9.6±5.4	-5.7±8.0	-0.04±0.09	-0.11±0.21	0.11±0.12	8±27	0.13±0.15	0.06±0.07	-0.02±0.09
105	MW-50@42'	11/15/06	2,740±350	-1.3±9.4	12.46±0.83	-1.5±1.6	1.7±1.7	7±19	1.0±3.7	4.4±5.2	-3.4±8.0	0.06±0.07	0.02±0.25	0.00±0.08	27±31	0.08±0.13	0.06±0.09	0.00±0.09
106	MW-50@67'	11/15/06	5,620±470	-0.7±9.5	27.1±1.3	-0.1±2.1	0.1±2.2	9±19	0.1±3.6	7.9±5.3	-5.7±8.0	0.02±0.09	0.03±0.18	0.07±0.07	28±31	0.04±0.14	0.02±0.07	-0.11±0.14
107	MW-42@43'	11/16/06	2,100±340	3.4±9.3	11.2±2.5	8,380±270	2.3±3.5	0±40	13.3±9.9	295±25	5±15	0.09±0.10	-0.13±0.16	0.13±0.16	5±38	0.06±0.15	0.06±0.07	-0.06±0.09
108	MW-42@45.5'	11/16/06	2,590±370	-4.9±9.2	11.9±2.2	8,270±260	2.7±2.4	19±40	9.1±9.8	290±25	14±15	0.12±0.11	-0.02±0.09	0.08±0.08	-10±39	0.15±0.16	0.03±0.17	0.00±0.16
109	MW-42@48'	11/16/06	2,200±350	-4.4±9.2	8.9±2.9	7,730±250	3.8±3.1	5±40	29±10	249±23	8±15	0.02±0.14	0.15±0.15	0.07±0.07	28±41	0.02±0.14	0.25±0.16	0.00±0.10
110	MW-58@26'	11/16/06	10±240	2.7±9.3	0.37±0.32	-0.7±2.2	1.5±2.5	3±20	3.1±3.9	0.1±5.6	9.8±8.7	0.02±0.04	0.02±0.16	0.08±0.10	8±40	0.04±0.22	-0.10±0.16	-0.02±0.25

NOTE: Reported uncertainties are ± two sigma total propagated uncertainties

ORISE Results for Onsite Wells (pCi/l) (8/8/07)

A	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R
111	Sample ID	Sample Date	H-3	C-14	Sr-90	Cs-137	Co-60	Fe-55	Ni-59	Ni-63	Tc-99	Np-237	Pu-238	Pu-239/240	Pu-241	Am-241	Cm-242	Cm-243/244
112	MW-58@65'	11/16/06	120±250	7.1±9.4	0.12±0.31	1.6±3.7	1.0±2.3	8±20	2.3±3.9	0.5±5.6	6.6±7.7	0.02±0.12	0.24±0.20	0.11±0.10	-12±43	-0.16±0.24	0.11±0.16	-0.31±0.26
113	MW-59@31'	11/16/06	70±240	-0.4±9.2	0.32±0.34	1.9±4.8	1.8±2.1	4±20	0.4±3.9	1.4±5.6	9.2±7.8	-0.06±0.16	0.00±0.19	0.04±0.08	-22±38	0.19±0.17	0.24±0.17	0.07±0.11
114	MW-59@45'	11/16/06	130±250	-1.1±9.2	0.25±0.33	1.6±2.0	0.3±1.7	-10±20	-5.4±3.8	4.8±5.7	2.3±7.6	-0.53±0.29	0.28±0.24	0.00±0.13	-32±68	0.16±0.13	0.16±0.13	0.03±0.12
115	MW-59@68'	11/16/06	90±240	4.2±9.3	0.56±0.33	0.3±2.3	0.2±2.3	8±20	0.0±3.9	1.2±5.6	2.8±7.6	-0.07±0.14	0.07±0.14	0.02±0.08	-29±41	0.11±0.16	0.20±0.17	0.06±0.08
116	MW-39@200'	11/17/06	10±240	-0.3±9.2	1.97±0.41	-1.2±2.6	-1.0±2.8	-5±20	6.8±4.0	-3.0±5.5	9.2±7.8	0.05±0.09	0.09±0.18	0.02±0.05	20±42	0.05±0.12	0.05±0.10	0.00±0.07
117	MW-42@41'	11/17/06	2,060±340	1.1±9.3	8.8±2.6	8,270±280	1.9±3.4	-3±40	10.0±9.9	201±21	17±16	0.06±0.09	0.04±0.10	0.08±0.08	9±40	0.08±0.16	0.03±0.14	0.00±0.08
118	MW-38	11/22/06	40±220	5.0±9.5	0.19±0.50	4.9±2.8	1.9±2.3	12±19		1.5±6.3	5.9±9.0	-0.19±0.14	-0.08±0.21	0.06±0.07	20±35	0.39±0.24	-0.02±0.09	-0.06±0.20
119	MW-48@23'	11/22/06	190±230	9.3±9.6	0.13±0.33	0.4±1.8	1.3±1.6	43±20		-0.7±6.3	4.7±9.0	-0.02±0.08	0.12±0.24	0.03±0.05	6±34	0.11±0.23	-0.02±0.07	0.03±0.16
120	MW-48@38'	11/22/06	80±230	1.3±9.4	-0.10±0.32	-1.8±4.3	2.4±2.1	-3±18		4.1±6.4	7.1±9.1	0.06±0.08	0.17±0.24	0.07±0.09	17±32	0.25±0.22	0.02±0.06	0.02±0.17
121	MW-60	11/30/06	180±230	12.4±9.7	0.41±0.54	1.3±1.7	-1.2±1.7	1±18		6.6±6.4	8.4±9.1	0.04±0.10	0.10±0.24	0.02±0.07	3±35	0.18±0.21	0.09±0.14	0.07±0.20
122	MW-62	11/30/06	620±260	0.7±9.4	0.70±0.54	0.0±3.4	0.3±2.5	-8±18		3.8±6.4	3.9±9.0	0.09±0.10	0.11±0.17	0.02±0.08	-9±30	0.14±0.15	0.02±0.08	0.07±0.14
123	MW-51@200'	12/06/06	70±200	0±12	0.37±0.36	-1.0±4.5	1.1±2.3	-2±19		0.2±5.6	-2.7±8.1	-0.06±0.10	0.21±0.20	0.04±0.06	23±34	0.09±0.15	0.05±0.08	-0.05±0.11
124	MW-40	12/07/06	290±220	1±12	0.61±0.35	0.2±1.8	0.3±1.7	13±20		1.8±5.7	5.2±8.3	0.06±0.07	0.24±0.24	0.08±0.08	14±35	0.23±0.21	0.02±0.09	-0.02±0.13
125	MW-30@74'	01/16/07	82,700±3,000		0.2±1.0	1.2±2.8				9.0±5.4								
126	MW-30@88'	01/16/07	7,280±440		0.6±1.1	0.3±2.2				10.0±5.4								
127	MW-31@53'	01/18/07	1,340±230		-0.6±1.0	2.3±5.7				9.1±5.4								
128	MW-31@67'	01/18/07	13,660±660		-0.3±1.0	1.0±2.6				8.5±5.4								
129	MW-31@89'	01/18/07	2,270±270		0.2±1.1	0.6±2.1				5.6±5.4								
130	MW-32@62'	01/19/07	7,360±440		0.2±1.1	1.3±2.9				5.1±7.5								
131	MW-32@92'	01/19/07	10,620±550		-0.1±1.1	0.7±5.5				9.2±5.4								
132	MW-32@140'	01/19/07	10,480±550		0.2±1.0	4.9±4.5				3.8±5.4								
133	MW-32@160'	01/19/07	10,520±550		0.4±1.1	-0.7±2.1				9.3±5.4								
134	MW-32@197'	01/19/07	11,000±571		0.6±1.1	2.4±2.4				5.1±5.4								
135	MW-48@23'	02/09/07	430±250	2.7±9.1	0.12±0.43	0.2±2.1	0.7±2.4	-30±45		3.5±3.0	11.3±7.9	0.02±0.09	0.02±0.14	0.04±0.08	-7±30	-0.07±0.22	0.02±0.10	-0.05±0.18
136	MW-48@38'	02/09/07	80±220	2.9±9.1	0.39±0.45	0.4±1.6	0.2±1.7	-30±45		0.1±3.0	6.4±7.8	-0.11±0.11	0.15±0.17	0.11±0.11	-14±32	-0.05±0.21	-0.09±0.10	0.13±0.16
137	MW-38@19'	02/12/07	2,290±350	3.6±9.1	0.43±0.48	-0.5±2.2	0.7±2.6	-23±45		3.4±3.0	7.7±7.8	0.05±0.09	0.18±0.17	0.00±0.06	27±32	0.14±0.18	-0.03±0.10	-0.02±0.13
138	MW-54@38'	05/03/07	1,000±210		12.2±1.1	2.4±4.6				6.6±4.4								
139	MW-54@59'	05/03/07	420±190		3.09±0.67	-1.0±2.2				5.3±4.3								
140	MW-54@125'	05/03/07	1,390±220		21.3±1.5	2.1±1.9				5.2±4.3								
141	MW-54@146'	05/03/07	1,720±240		16.9±1.3	-1.0±2.3				5.7±4.3								
142	MW-54@174'	05/03/07	1,830±240		19.4±1.4	1.3±4.6				8.9±4.4								
143	MW-54@192'	05/03/07	1,860±240		22.5±1.6	0.5±2.2				6.4±4.4								
144	MW-60@37'	05/08/07	-40±160			-0.5±1.6												
145	MW-60@54'	05/08/07	240±170			-2.0±3.1												
146	MW-60@74'	05/08/07	250±170			-2.5±3.3												
147	MW-60@137'	05/08/07	290±170			0.2±2.1												
148	MW-60@156'	05/08/07	170±170			-0.6±1.7												
149	MW-60@178'	05/08/07	840±200			0.0±2.9												
150	MW-62@55'	05/10/07	340±180			-1.8±3.6												
151	MW-62@73'	05/10/07	500±180			1.9±2.2												
152	MW-62@94'	05/10/07	430±180			0.7±2.3												
153	MW-62@140'	05/10/07	410±180			0.1±1.6												
154	MW-62@184'	05/10/07	430±180			2.1±2.3												
155	MW-63@52'	05/15/07	390±180			-3.1±3.8												
156	MW-63@93'	05/15/07	270±170			-0.5±2.1												
157	MW-63@114'	05/15/07	390±180			-0.3±1.7												
158	MW-63@124'	05/15/07	630±190			-4.1±3.6												
159	MW-63@164'	05/15/07	590±190			0.7±2.2												
160	MW-63@176'	05/15/07	680±190			0.2±1.7												
161	MW-62@15'	05/17/07	270±170			-2.2±3.5												
162	MW-62@38'	05/17/07	190±160			0.0±1.6												
163	MW-63@19'	05/18/07	250±170			-0.4±2.3												
164																		
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166																		
167																		
168	xxxxx																	

NOTE: Reported uncertainties are ± two sigma total propagated uncertainties

From: "Sandike, Steven Richard" <SSandik@entergy.com>
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Date: 01/19/2007 5:59:06 PM
Subject: Assessment of Sr-90 results in fish/inv

All... Dennis Quinn and I have evaluated the fish/inv analyses results with an eye toward a conservative evaluation of dose impact, assuming of course, the recent analytical results are valid. This assessment is by no means final, but this doc provides an initial determination of worst case dose impact, and what IPEC would have to be releasing to produce this kind of concentration in fish.

<<chm-07-002.pdf>>

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Jan 17, 2007
IPEC-CHM-07-002

MEMORANDUM TO: T. BURNS –NEM SUPERVISOR

FROM: S. SANDIKE – Sr. CHEMISTRY SPECIALIST SPS

SUBJECT: DOSE ASSESSMENTS FROM Sr-90 IN THE HUDSON RIVER FOR FISH AND INVERTEBRATES - JANUARY 2007 RESULTS

This report summarizes some worst-case assessments of the Sr-90 identified in early reports of the fall, 2006 batch of REMP samples sent to Areva. I used the 24.5 pCi/kg value in white perch and the 13.9 pCi/kg value in blue crab to bound the dose assessment.

This simple evaluation does NOT account or discuss any of the finer elements of error propagation, critical level, environmental BKGD, constants for non-random error, or other improvements we are discussing with labs. It conservatively assumes all fish and crab identified in the recent lab results are consumed by humans at the RG1.109 consumption rate, and at the highest concentrations reported from this batch of samples. Furthermore, we are assuming that these initially reported concentrations are accurate.

With these bounding conditions, we can obtain annual doses as follows:

		Reg Guide 1.109 and ODCM				
	Fish/Inv Conc, pCi/kg	mrem/pCi ingestion dose factor	Fish usage factor kg/yr	Inv usage factor kg/yr	human total dose expected, annually, mrem	percent of annual limit
Adult	25 / 14	7.58E-03	21	5	4.41	44.1%
Teen	25 / 14	8.30E-03	16	3.8	3.68	36.8 %
Child	25 / 14	1.70E-02	6.9	1.7	3.27	32.7 %
Infant	25 / 14	1.85E-02	0	0	0.00	n/a

The dose and usage factors above, obtained from Reg Guide 1.109 are identical to those used in the IPEC ODCMs (we do NOT use site specific data for these values).

This evaluation indicates that should all edible aquatic food in this location be consumed at the rates identified in Regulatory Guide 1.109 (at the highest reported concentrations of Sr-90), the maximum individual annual dose would be about 4.4 mrem, or 44% of the annual bone dose (combining the fish and invertebrate dose contribution at this concentration).

If we evaluate ALL the Sr-90 released in liquid effluent from IPEC since 2000, and INCLUDE a conservative assessment of Ground Water's contribution, we can project the IPEC-induced worst case concentration in fish. From the annual effluent reports (Reg Guide 1.21) and the ODCM's Bio-Accumulation Factor for Sr-90, we can conservatively produce the following table:

year	Routine Sr-90 Curies	GW Sr-90 Curies	Total Sr-90 Curies	Annual Discharge Canal Dilution Volume, Liters	Annual Dilution Volume Determined for Ground Water, Liters	Diluted Sr-90 concentration in water, outside IPEC, in pCi/L	Fish Bio-accum factor	calculated expected fish pCi/kg
2000	4.00E-03	3.35E-04	4.34E-03	2.78E+12	2.21E+11	2.95E-03	30	8.86E-02
2001	5.00E-03	3.35E-04	5.34E-03	2.78E+12	2.21E+11	3.31E-03	30	9.94E-02
2002	2.45E-03	3.35E-04	2.79E-03	2.78E+12	2.21E+11	2.40E-03	30	7.19E-02
2003	7.30E-03	3.35E-04	7.64E-03	2.78E+12	2.21E+11	4.14E-03	30	1.24E-01
2004	1.74E-02	3.35E-04	1.77E-02	2.78E+12	2.21E+11	7.77E-03	30	2.33E-01
2005	6.42E-04	3.35E-04	9.77E-04	2.78E+12	2.21E+11	1.75E-03	30	5.24E-02
2006	3.80E-04	5.00E-04	6.80E-04	2.78E+12	2.21E+11	2.40E-03	30	7.20E-02
units	curies	curies	curies	liters	liters	pCi/L	pCi/kg per pCi/L	pCi/kg

Note: 2006 data is estimated, but should be relatively accurate.

While we should NOT discount the value originally determined by Areva, this evaluation indicates that we must perform additional investigation in an attempt to validate and understand the 25 pCi/L recently identified at our control location in Roseton.

Even in a very conservative model, total IPEC effluent of Sr-90 would need to approach 1.9 curies in a year to produce this concentration in fish. This is over 100 times the highest annual total and higher than the last 7 years combined.

Certainly, a small amount of Strontium can build up in fish over many years. However, since the average age of Hudson Valley White Perch is 3-4 years (and a maximum of approximately 7 years [1]), it is NOT reasonable to assume that IPEC is releasing Sr-90 several hundred times that of the combined conservative measurements without a single effluent or other REMP sample showing this concentration, or the accompanying gamma concentrations. Nonetheless, this scenario should be evaluated along with other, more reasonable possibilities, such as lab error and environmental background components.

Also attached is an independent evaluation from D. Quinn, itemizing dose from each species analyzed.

SS/ss

cc: J. Adler P. Donahue D. Gray D. Wilson

1) Wong, Russell, NC State University, Zoology Dept, 2002; Cooper, 1939; Normandeau, 2007

Evaluation submitted by D. Quinn, of DAQ-inc, Jan 16, 2007

Evaluating 2005 data from the annual effluent report:

Based on ODCM values and 2005 1.21 Report Data

Total Sr-90 Released	6.40E-04	Ci
Volume of Dilution Water	2.78E+12	flow (L)
Ci Sr-90 per L of water	2.30E-16	
Ci - pCi conversion factor	1.00E+12	
Total Sr-90 Released	2.30E-04	pCi/L
	30	BFI (pCi/Kg/pCi/L)
Calculated expected Sr90 in Fish	6.91E-03	pCi/kg

Dennis then evaluated the Strontium dose in ALL species from the last batch of sample results from Areva:

Dose from Sr-90 in Fish assuming RG 1.109 Parameters

Sample Description	pCi/kg Sr-90 in fish	pCi/kg measured MDC	UF (kg/yr)	Dfi (mrem/pCi)	Dose (mrem/yr)	Organ	Limit (mrem/yr)	Percent of Limit
IP White Perch - IP 06-575	18.8	9.0	21	7.58E-03	3.0	Bone	10.0	30%
IP Cat Fish - IP 06-577	-1.0	8.4	21	7.58E-03	ND	Bone	10.0	N/A
IP American Eel - IP 06-579	2.3	7.1	21	7.58E-03	ND	Bone	10.0	N/A
IP Sun Fish - IP 06-576	10.2	15.0	21	7.58E-03	ND	Bone	10.0	NA
IP Striped Bass- IP 06-578	4.2	8.5	21	7.58E-03	ND	Bone	10.0	NA
IP Blue Crab - 06-580	4.5	5.7	5	7.58E-03	ND	Bone	10.0	N/A
Roseton White Perch - IP 06-581	24.5	8.7	21	7.58E-03	3.9	Bone	10.0	39%
Roseton Cat Fish - IP 06-583	2.4	7.6	21	7.58E-03	ND	Bone	10.0	N/A
Roseton American Eel - IP 06-585	3.5	4.3	21	7.58E-03	ND	Bone	10.0	N/A
Roseton Sun Fish IP 06-582	17.1	9.6	21	7.58E-03	2.7	Bone	10.0	27%
Roseton Striped Bass - IP 06-584	2.1	4.2	21	7.58E-03	ND	Bone	10.0	N/A
Roseton Blue Crab IP 06-582	13.6	11	5	7.58E-03	0.5	Bone	10.0	5%

UF = Usage Factor = 21 kg/yr for adult fish consumption, Unit 3 ODCM, Part II, section 2.4.3, and from RG 1.109 Table E-5

DF_i = Dose conversion factor for nuclide i (in this case, Sr-90) for adult (mrem/pCi ingested), RG 1.109, Table E-11, and U3 ODCM, Table 3-3a

ND = Not detectable

N/A = Not applicable

DF = Dose conversion factor for nuclide i, for age groups in pre-selected organs T, in mrem/pCi, from Tables E-11, 12 & 13 of Regulatory Guide 1.109